We claim:

1. An interconnect structure formed within a dielectric material comprised of at least one dielectric reactant element, comprising:

a conductive fill material filling an interconnect opening formed within the dielectric material and comprised of first and second dopant elements that are different;

a diffusion barrier material, that surrounds the conductive fill material, comprised of the first dopant element and a dielectric reactant element; and

a boundary material, that surrounds the conductive fill material, comprised of the second dopant element and a dielectric reactant element.

2. The interconnect structure of claim 1:

wherein the diffusion barrier material prevents diffusion of the conductive fill material into the dielectric material,

and wherein the boundary material prevents diffusion of a dielectric reactant element from the dielectric material into the conductive fill material.

3. The interconnect structure of claim 1, wherein the conductive fill material is comprised of a bulk conductive fill material that is copper doped with the first and second dopant elements.

4. The interconnect structure of claim 1, wherein the first dopant element and the second dopant element are each a respective metal element.

5. The interconnect structure of claim 4, wherein a dielectric reactant element is one of oxygen, nitrogen, or carbon such that the diffusion barrier material is one of a metal oxide, a metal nitride, or a metal carbide.

6. The interconnect structure of claim 5, wherein the first dopant element includes at least one of Mg (magnesium), Ca (calcium), Cr (chromium), and Zr (Zirconium).

7. The interconnect structure of claim 5, wherein a dielectric reactant element is silicon such that the boundary material is a metal silicide.

8. The interconnect structure of claim 7, wherein the second dopant element includes at least one of Ti (titanium), Co (cobalt), Ni (nickel), and Ta (tantalum).

9. The interconnect structure of claim 1, wherein the interconnect opening is one of a metal line, a via hole, or a dual damascene opening.